MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

BMT1014 – MANAGERIAL MATHEMATICS

(All sections / Groups)

5 MARCH 2016
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** printed pages excluding the cover page.
2. Answer all **FOUR (4)** questions.
3. Write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.
4. **ONLY** non-programmable calculator is allowed to be used for this exam.
5. Mathematical formulae are attached at the end of the question paper.

Question 1 (25 Marks)

(a) Suppose we have two straight lines, L1 and L2.

(i) Find an equation of L1 that passes through the points (2, 6) and (1, -3). [5 marks]

(ii) Find an equation of L2 that passes through the points (1, 3) and (0, 2). [5 marks]

(iii) Determine whether L1 and L2 are parallel, perpendicular or neither. [2 marks]

(b) A spectacles manufacturer has a fixed monthly cost of RM12, 600. If each pair of spectacles has a cost RM150 and sells for RM300 find the

(i) Cost function. [2 marks]

(ii) Revenue function. [2 marks]

(iii) Profit function. [3 marks]

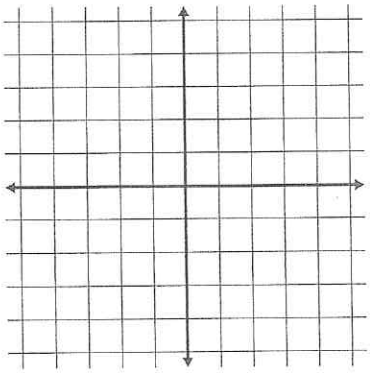
(iv) Profit from 200 pair of the spectacles. [2 marks]

(c) Given the quadratic function $f(x) = x^2 - 4x + 3$. Find the vertex. [4 marks]

Continued...

Question 2 (25 Marks)

(a) If a publisher wishes to purchase a total of *no more than 100* research books from supplier A and B, set up a system of inequalities that describes the possible combinations of quantities that can be purchased from each supplier. Sketch the solution in the plane.



[5 marks]

(b) Given an objective function $Z = x - 2y$,
which subject to the inequalities: $y - x \leq 2$, $y + x \leq 4$, $x \leq 3$ and $x, y \geq 0$.

(i) Find and sketch the bounded feasible region.
(ii) Find the corner points and then determine the maximum Z value.

[10 marks]

(c) Minimize the objective function $Z = 2x + 3y$

subject to

$$x + y \leq 2$$
$$2x + 5y \leq 10$$
$$5x + 8y \geq 20$$
$$x, y \geq 0$$

[10 marks]

Continued...

Question 3 (25 Marks)

(a) A debt of RM1500 due in **five years** and RM2000 due in **seven years** is to be repaid by a payment of RM2000 now and a second payment at the end of **three years**. How much should the second payment be if interest is at 3% compounded annually?

[7 marks]

(b) Find present value of an ordinary annuity of RM460 every month for **nine years** at the rate of 6% compounded monthly.

[5 marks]

(c) Says you borrow RM2000 and will pay off the loan by equal payments at the end of each month for **five years**. If interest is at the rate of **16.8%** compounded monthly, how much is each payment?

[5 marks]

(d) A fresh graduate is to amortize a RM7000 second hand car loan by making equal payments at the end of each month of **36 months**. If interest is at **4%** compounded monthly, find

(i) The amount of each payment.
(ii) The finance charge.

[8 marks]

Continued...

Question 4 (25 Marks)

(a) Find the third derivative of a function

$$g(x) = 5x^{\frac{1}{3}} - 2x^2 + \frac{1}{3}x + 2 .$$

[6 marks]

(b) Siti's Bakery manufactured 2 types of cakes, Tiramisu and Chocolate Cheese. If x is the number of units Tiramisu and y is the number of units of Chocolate Cheese, then the cost and the revenue in ringgit are

$$C(x, y) = 2x^2 - 2xy + y^2 - 7x - 10y + 11$$
$$R(x, y) = 5x + 8y$$

Find the numbers of each type of product that should be manufactured to maximize the profit. What is the maximum profit?

[14 marks]

(c) Evaluate the integral given

(i) $\int \frac{2\left(x^2+5\right)}{3} dx$

[2 marks]

(ii) $\int_0^1 z\left(z^2-1\right)^5 dz$

[3 marks]

End of Page.

Course: Managerial Mathematics
Code: BMT 1014

Summary of Principal Formulas and Terms

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Equation of a Straight Line

(i) Slope of a line, $m = \frac{y_2 - y_1}{x_2 - x_1}$

(ii) Point-slope form, $y - y_1 = m(x - x_1)$

(iii) Slope-intercept form, $y = mx + b$ (where m = slope, b = y-intercept)

(iv) General form, $Ax + By + C = 0$

3. Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)

(ii) Accumulated amount, $A = P(1 + rt)$

4. Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i = \frac{r}{m}$, and $n = mt$

(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

5. Effective Rate of Interest

$$r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$$

6. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

7. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

8. Amortization Formula

$R = \dfrac{Pi}{1-(1+i)^{-n}}$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

9. Sinking Fund Formula

$R = \dfrac{Si}{(1+i)^{n}-1}$ (R = periodic payment required to accumulate S dollars over n periods)

10. Basic Rules of Differentiation

(a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x)=0$

(b) Power rule : If $f(x)$ is x^n, then $f'(x)=nx^{n-1}$

(c) Constant multiple rule: Derive $cf(x)=cf'(x)$ (c is a constant)

(d) Sum rule: Derive $f(x)\pm g(x)=f'(x)\pm g'(x)$

(e) Product rule: If $f(x)=u\times v$, then $f'(x)=u\dfrac{dv}{dx}+v\dfrac{du}{dx}$

(f) Quotient rule: If $f(x)=\dfrac{u}{v}$, then $f'(x)=\dfrac{v\dfrac{du}{dx}-u\dfrac{dv}{dx}}{[v]^2}$

(g) Chain rule: Derive $g[f(x)]=g'[f(x)]f'(x)$

(h) General power rule: Derive $[f(x)]^n=n[f(x)]^{n-1}f'(x)$

(i) Exponential function: Derive $e^x=e^x$

Derive $(e^u)=e^u[u'(x)]$

(j) Logarithmic function: Derive $\ln x=\dfrac{1}{x}$

Derive $(\ln u(x))=\left(\dfrac{1}{u(x)}\right)[u'(x)]$

11. Basic Rules of Integration

(a) Indefinite integral of a constant: $\int k\ du=ku+C$

(b) Power rule: $\int u^n\ du=\dfrac{u^{n+1}}{n+1}+C$

(c) Constant multiple rule: $\int kf(u)\ du=k\int f(u)\ du$ where k is a constant

(d) Sum rule: $\int[f(u)\pm g(u)]\ du=\int f(u)du+\int g(u)du$

(e) Exponential function: $\int e^u\ du=e^u+C$

(f) Logarithmic function: $\int\left(\dfrac{1}{u}\right)\ du=\ln u+C$

12. Definite Integrals

a) The fundamental Theorem of Calculus:

Let f be continuous on [a,b], then,
$\int_a^b f(x)\,dx = F(b) - F(a)$ where F is any antiderivative of f; that is $F'(x) = f(x)$

b) Area between two curves:

Let f and g be continuous functions such that $f(x) \geq g(x)$ on the interval $[a,b]$. Then the area of the region bounded on $[a,b]$ is given by $\int_a^b [f(x) - g(x)]\,dx$.

13. Determining Relative Extrema

$D(x,y) = f_{xx} f_{yy} - (f_{xy})^2$

If D > 0 and $f_{xx} > 0$, relative minimum point occurs at (x, y).
If D > 0 and $f_{xx} < 0$, relative maximum point occurs at (x, y).
If D < 0, (x, y) is neither maximum nor minimum.
If D = 0, the test is inconclusive.